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Principal Component Analysis for archaeogeophysical data

Melda Kucukdemirci (1), Salvatore Piro (2), and Enrico Papale (2)

(1) Istanbul University, Geophysical Engineering Department, Avcilar Campus, 34320 Istanbul-Turkey (meldakd@istanbul.edu.tr), (2) Institute for Technologies Applied to Cultural Heritage (ITABC), CNR Research Area, Via Salaria, 00016 , Monteretondo St-Rome,Italy (salvatore.piro@itabc.cnr.it - enrico.papale@itabc.cnr.it)

Multimethodological geophysical data sets occasionally need to be examined more detaily above all for archaeological prospection to obtain accurate results. For this purpose to understand the relationship between different variables the statistical analysis can give quite important informations about the data sets. Principal Component Analysis (PCA) is a statistical approach which transforms a number of correlated variables into a smaller number of uncorrelated variables. These principal components let us reducing the dimension of large set of variables to a small set which still contains most of the information (Maindonald and Braun, 2010). The first component accounts for a greatest amount of total variance between the observed variables. The second component represent the greatest amount of variance in the data set that is not explained by the first component. Each new component accounts for gradually smaller and smaller amounts of variance. Briefly, the steps of Principal Component Analysis are: i) calculation of covariance matrix of the variables, ii) calculation of eigenvalues and eigenvectors of the covariance matrix, iii) evaluation of the scores of PCA, deriving the new data set that means new components. The detailed description are explained in the paper of Smith (2002) and Davis (1973). In this work, the employment of principal component analysis to analyse archaeogeophysical data for statistical data integration of 2 dimensional geophysical maps are presented. The relationship of the variables are examined and new principal components are derived. The sucess of this statistical integration approach is discussed after the application on several data sets related to two different archaeological sites in Turkey and Italy.